5th INTERNATIONAL CONFERENCE ON NATURAL AND APPLIED SCIENCE AND ENGINEERING
(ICNASEN-2023)
26-28 May 2023, Ürgüp-Nevşehir-TURKEY

Abs. No: 110

Investigation Of Energy Consumption In The Production Of Hydrochar And Enrichment With Ammonium Adsorption

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ABSTRACT

Industrial and domestic agricultural wastes that arise with increasing population create serious environmental problems and therefore it is important to dispose of them. Two-way gains can be achieved by converting these agricultural wastes into products with industrial use potential such as biochar. The most traditional method used to obtain biochar is pyrolysis. The structural properties of biochar vary depending on the pyrolysis conditions and the type of raw material used. The structural properties of biochar are very decisive for its performance in applications (such as adsorption, energy and soil improvement) in which it is used. Therefore, the evaluation of the biochar production condition for the application area can provide optimum gains. An alternative to pyrolysis is hydrothermal carbonization, in which wet biomass is transformed to hydrochar under subcritical water conditions without pretreatments such as drying and washing. In this study, the conversion of corncob, which is an agricultural waste that occurs in significant amounts globally, into hydrochar was provided by subcritical water and microwave-assisted hydrothermal carbonization. In addition, the removal potential of ammonium from water, an important water pollutant, using hydrochar obtained by two different methods was investigated. Effective production methods and effective environmental conditions were evaluated for ammonium adsorption from corncob. It was determined that hydrochars produced with microwave-assisted HTC provided higher ammonium removal than those obtained with subcritical water. As a result, both the added value of food waste was increased and the removal of ammonium from water was achieved. In addition, by enriching the hydrochars with ammonium, the final product obtained has been ensured to be a potential fertilizer source. Energy consumption in hydrochar production processes has an important place in terms of feasibility and sustainability. In the study, the energy consumption of hydrochar production with subcritical water and microwave-assisted HTC was calculated as 36.42 kwhm-3 and 23.18 kwhm-3 per kg hydrochar, respectively. The microwave-assisted method was found to be more advantageous in the cost evaluation of production and adsorption processes.

Keywords: *Waste corncob, Ammonium, Hydrochar, Carbonisation, Enrichment*

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Acknowledgements: This study was supported by a research grant of Mersin University BAP (Grant no: BAP-2022-1-TP2-4699)